

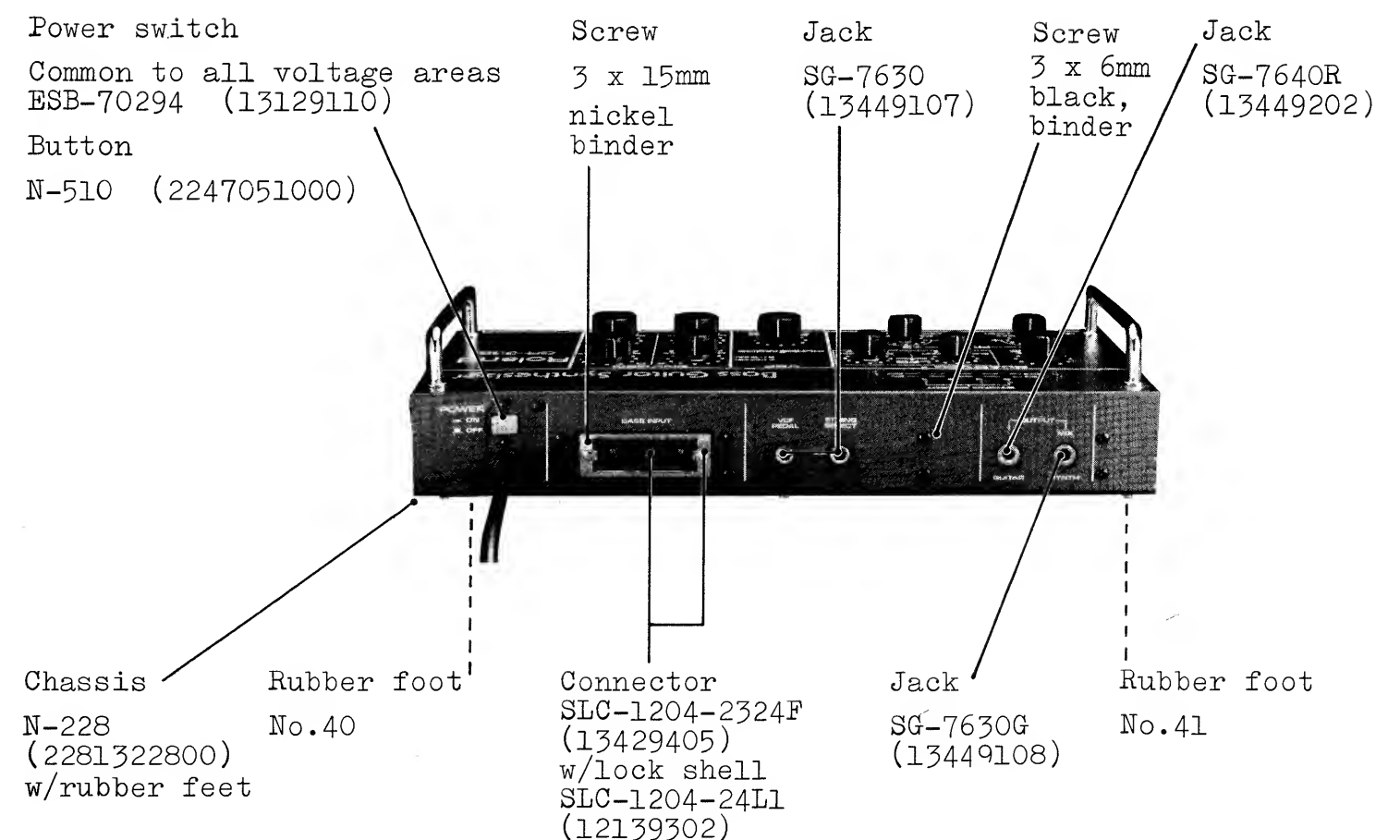
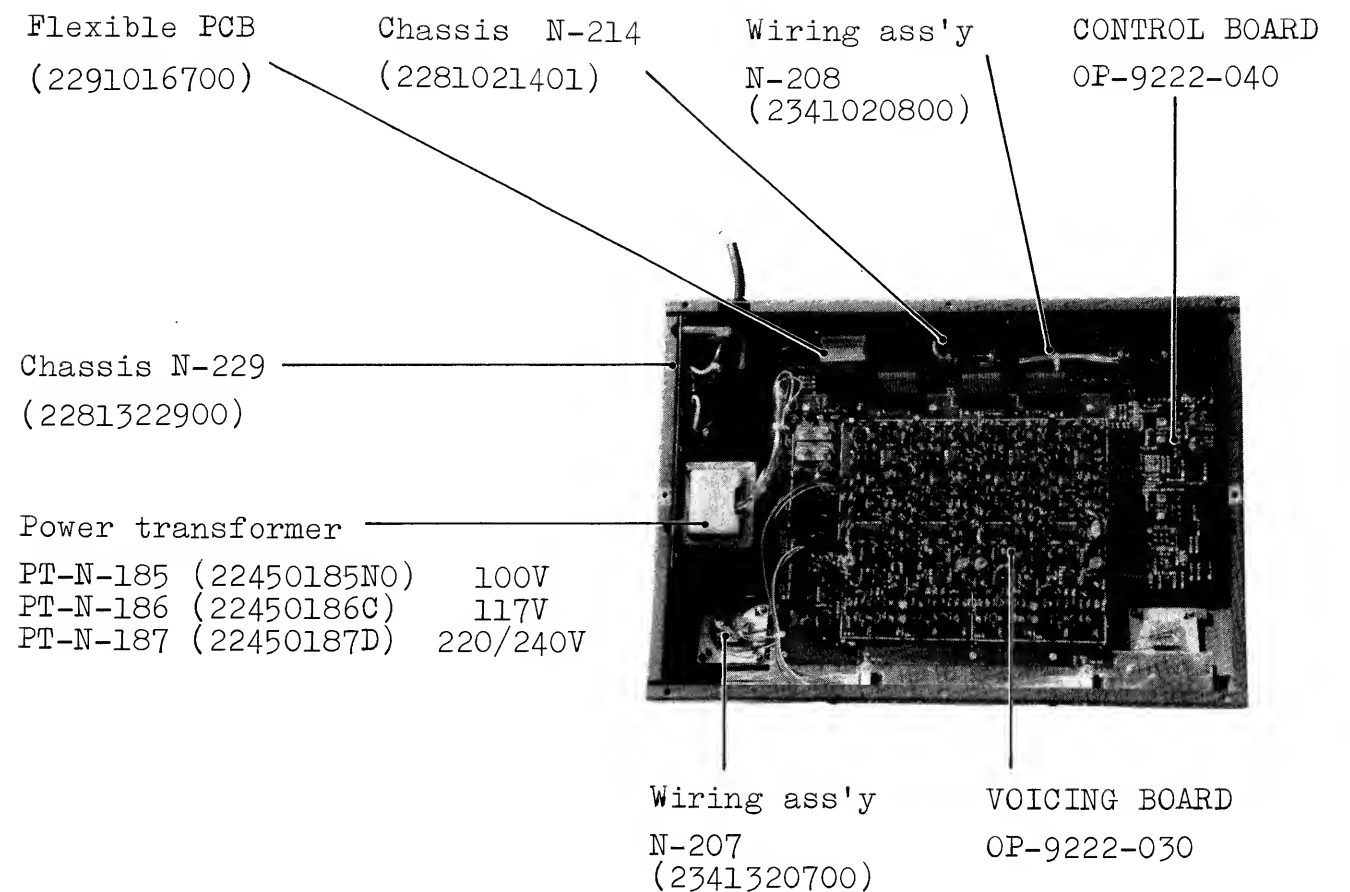
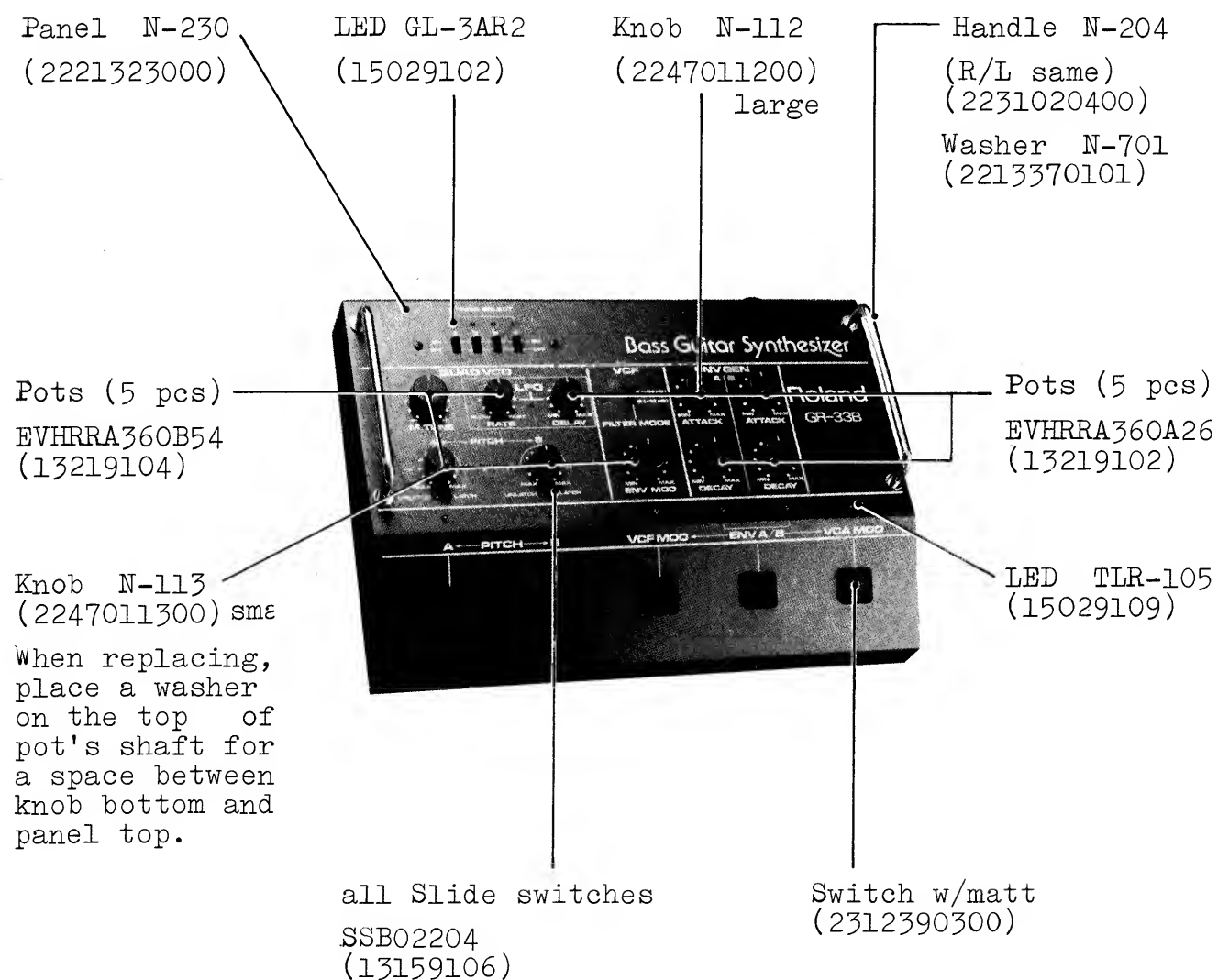
GR-33B, G-33/G-88

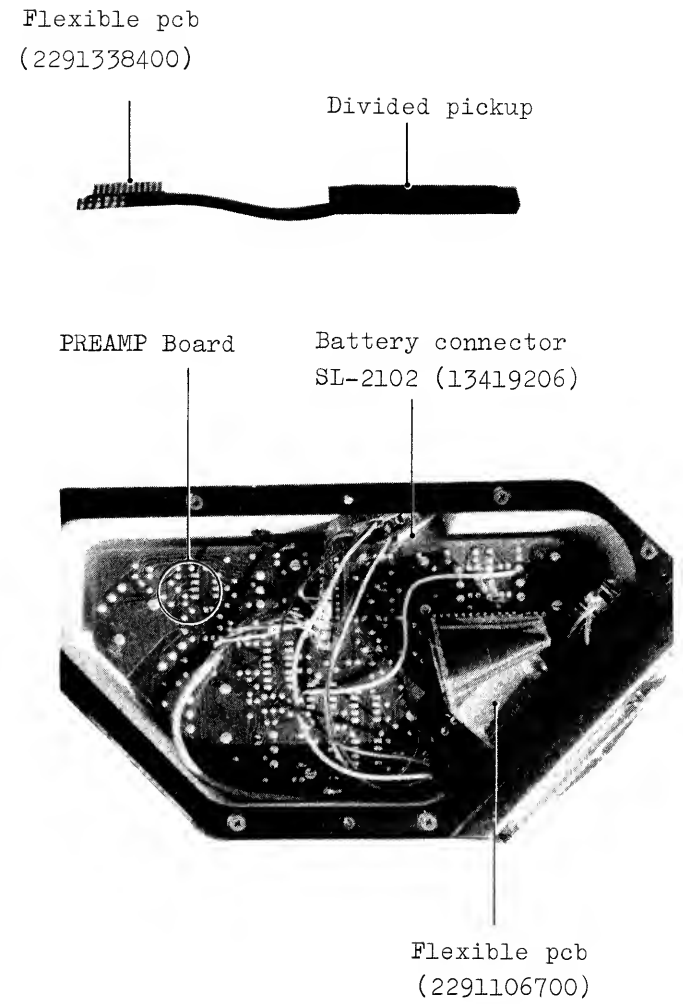
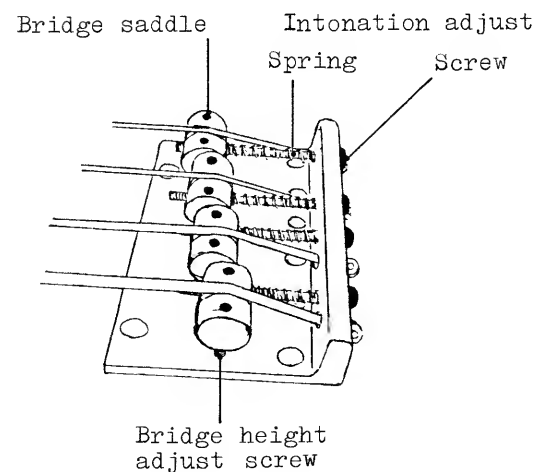
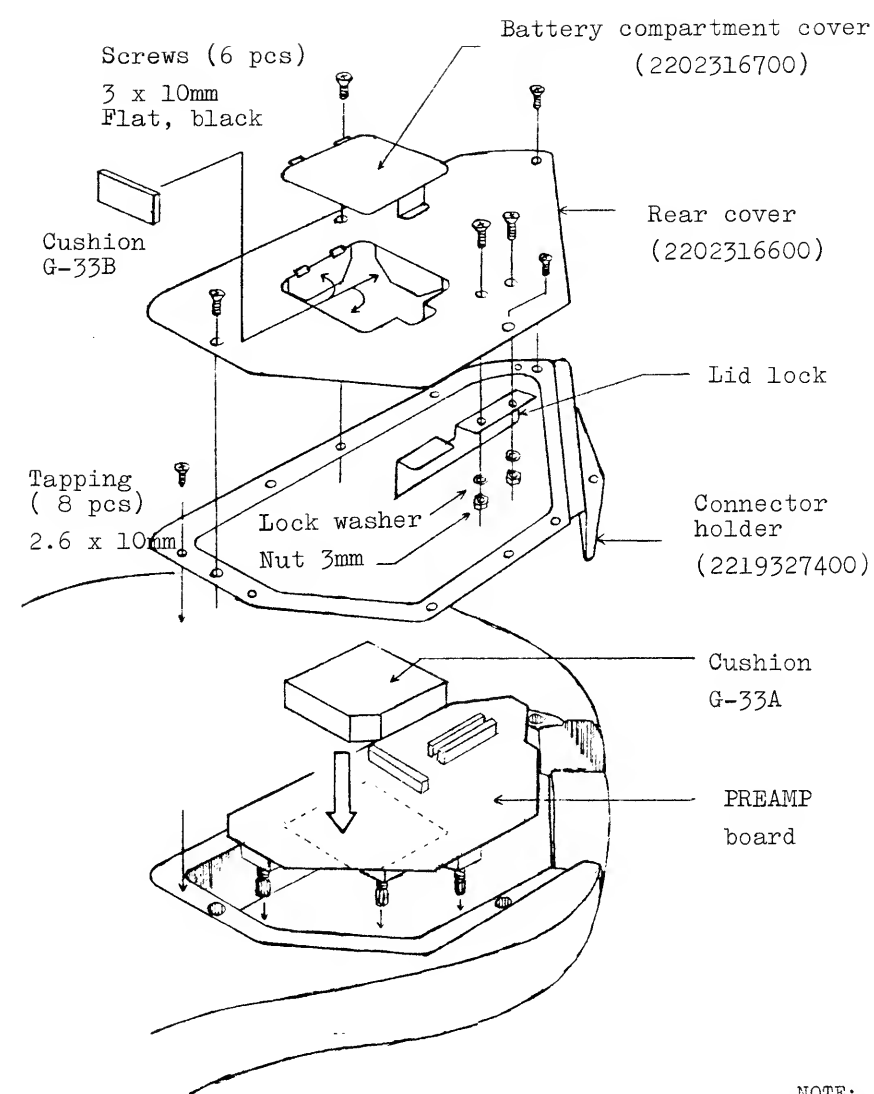
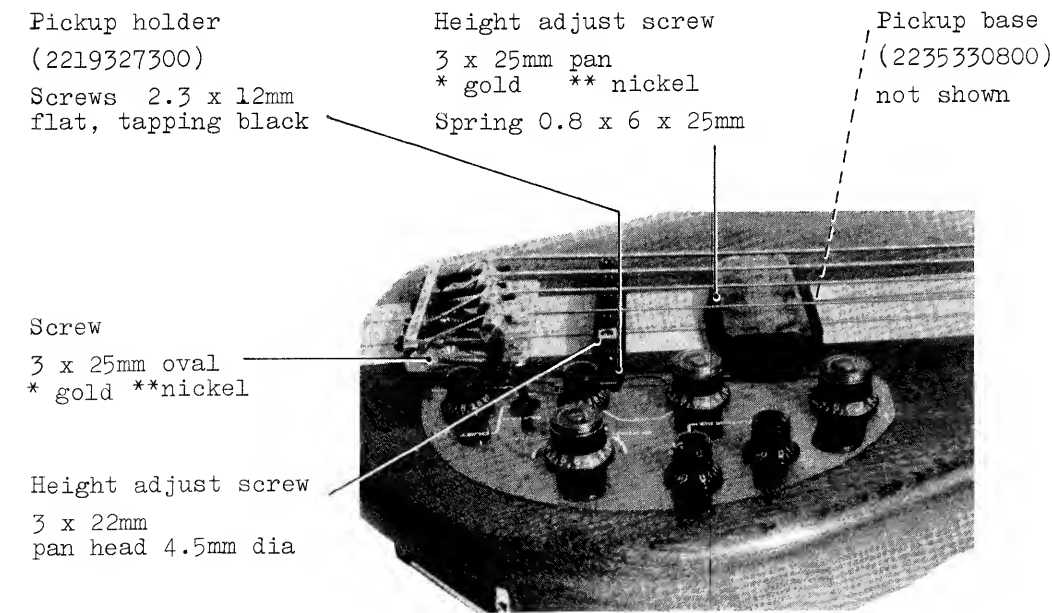
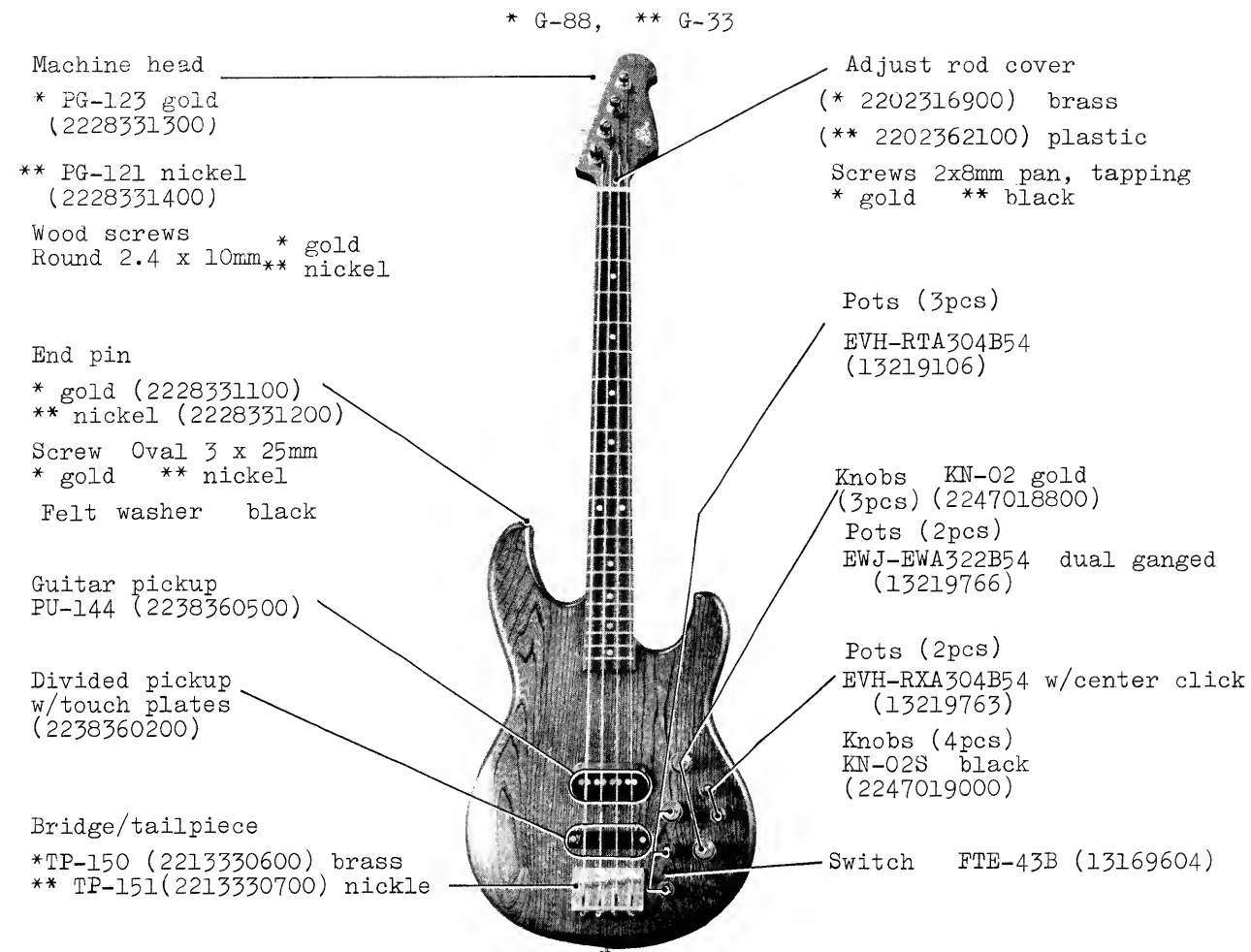
SERVICE NOTES

SPECIFICATIONS

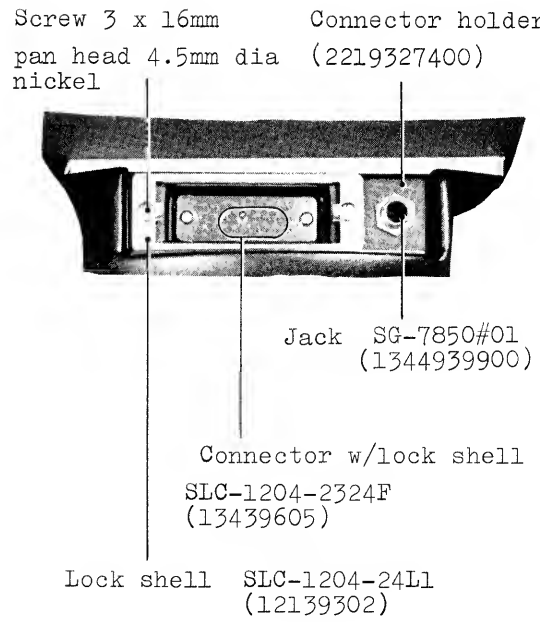
First Edition

PITCH SHIFT RANGE --- PITCH A/B: ± 1300 cents
 ATTACK TIME ----- 0-3 seconds
 DECAY TIME ----- 0-10 seconds
 POWER CONSUMPTION --- 24 watts
 DIMENSIONS ----- 400(W) x 290(D) x 100(H)
 WEIGHT ----- GR-33B: 5Kg; G-33/G-88: 4.2Kg





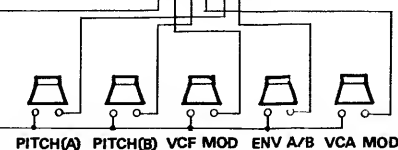
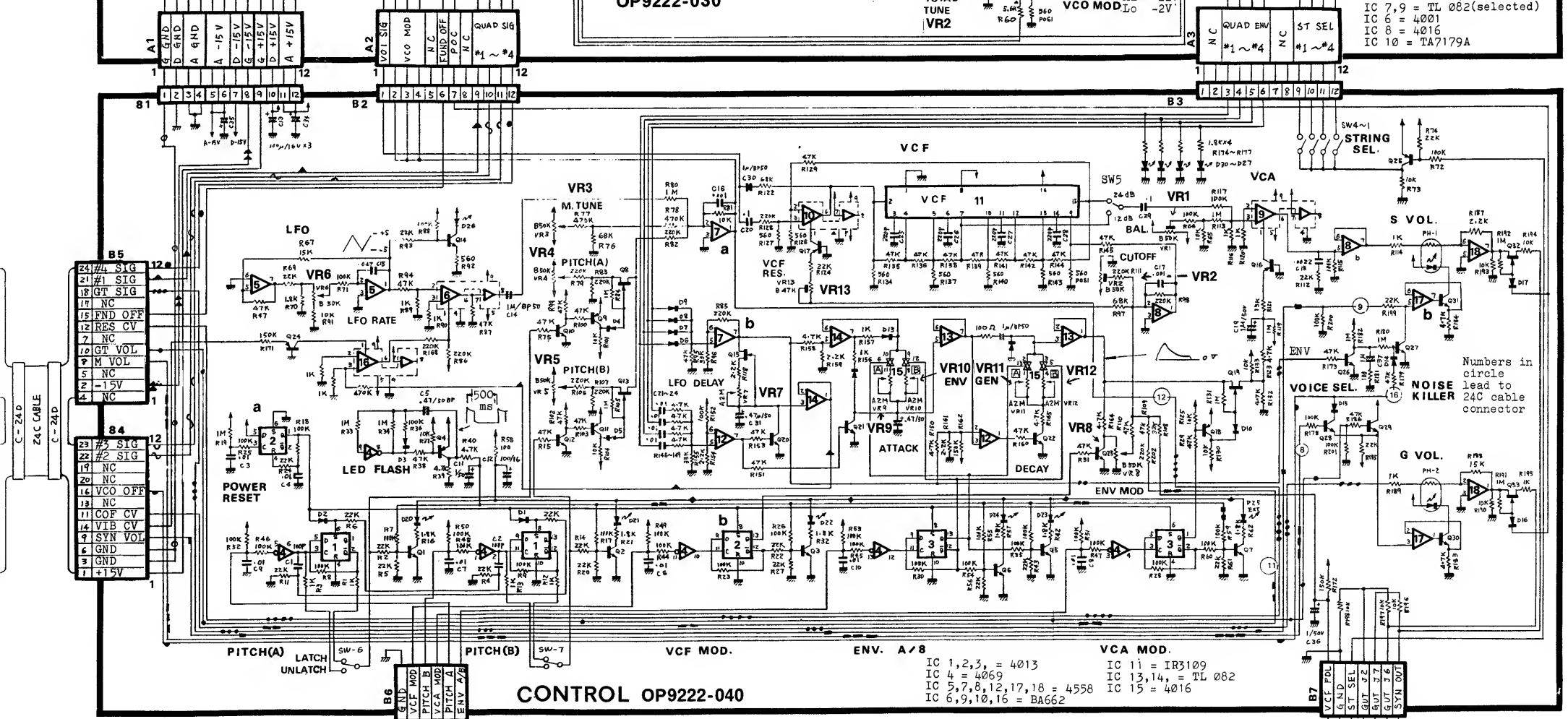
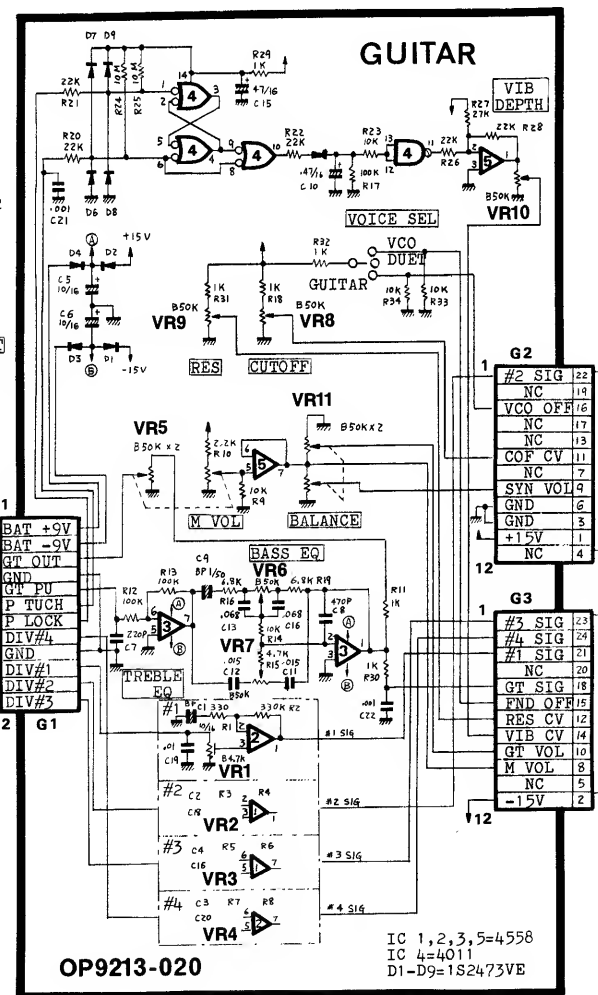
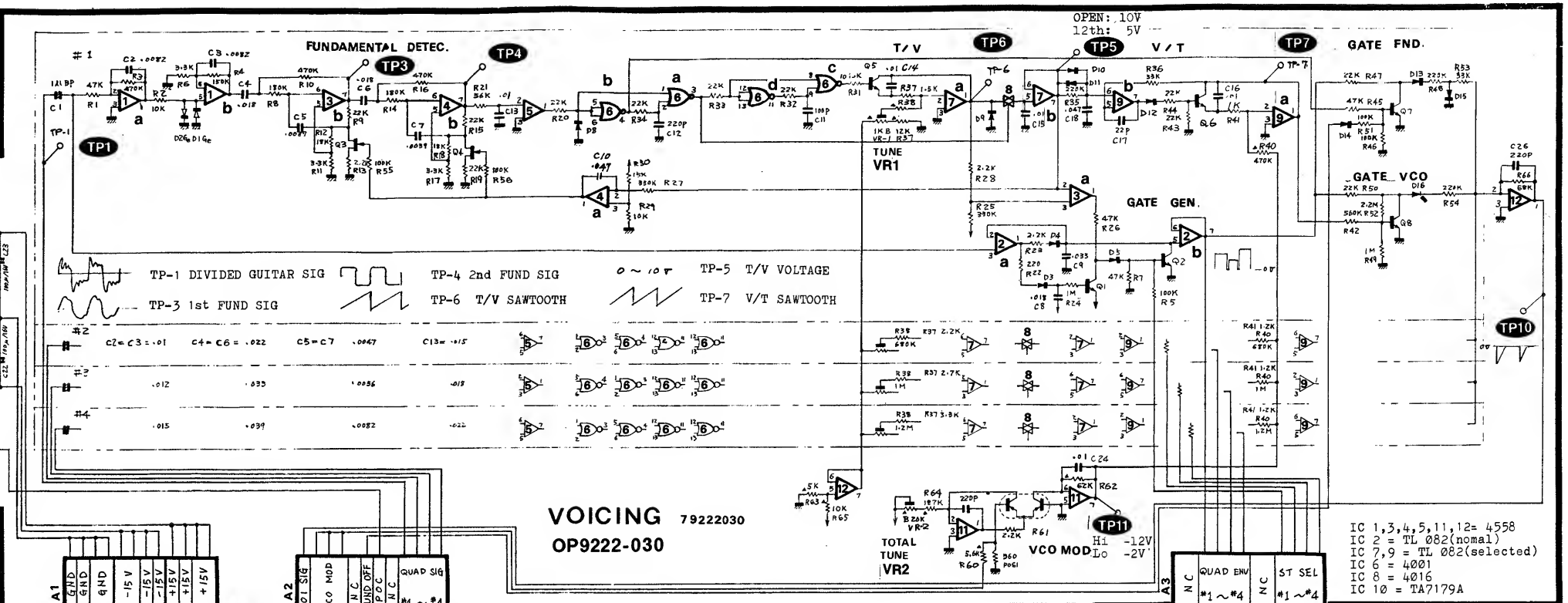
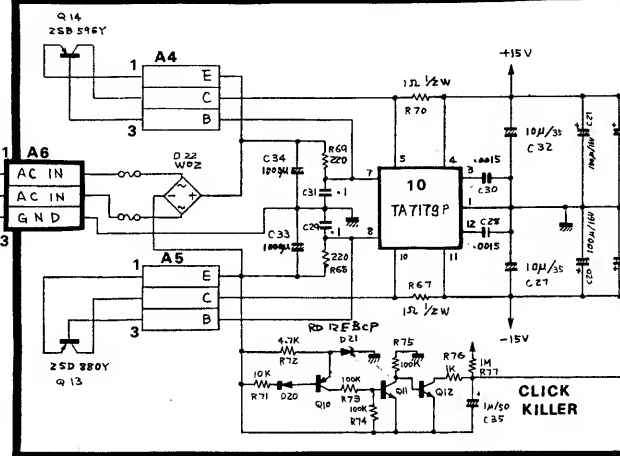
NOTE:
Head diameter is slightly smaller than ordinary 3mm screw's.





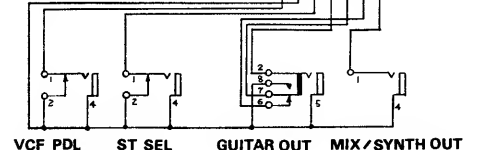
GR-33B CIRCUIT DIAGRAM

SECONDARY RATING
20VAC x 2 @ 300mA



- TP-1 DIVIDED GUITAR SIG
TP-3 1st FUND SIG
TP-4 2nd FUND SIG
TP-6 T/V SAWTOOTH
5 T/V VOLTAGE
TP-7 V/T SAWTOOTH

- 2SA 733Q
2SC 1740, 945Q
2SK 30A GR
1S 188
1S 2473



CIRCUIT DESCRIPTION

GR-33B circuits are mostly built on two PCBs:
Voicing Board OP-9222-030 and Control Board
OP-9222-040.

VOICING BOARD OP-9222-030

1. FUNDAMENTAL DETECTOR
2. T/V CONVERTER
3. V/T CONVERTER
4. GATE GENERATOR
5. CHOPPER GATE
6. POWER SUPPLY

1. FUNDAMENTAL DETECTOR

This detector, the heart of GR-33B, strips incoming signals off harmonics and leaves fundamental. In the following, only channel #1 circuit is described since this detector is composed of the same four circuits.

The output signal coming from the divided pickup is applied through LPF/Buffer IC1a to COMPRESSION circuit consisting of clamp diodes D1-Ge and D2-Ge followed by another LPF IC1b.

1-1. Band-Pass Filter (BPF)

A two-stage filter, consisting of cascaded IC3b and IC4b, largely jumps its frequency response when a string is plucked with low fretting and then higher fretting, and vice versa. When channel #1 string at lower fret(0-6th) is played, Q3 and Q4 are cut off by the potential from IC4a whose pin 2 is kept positive with respect to pin 3 by T/V output (IC7b). Q3 and Q4, during off, make 1st and 2nd filters' component values the same to provide overall peak frequency at F1 that corresponds to fundamental of the

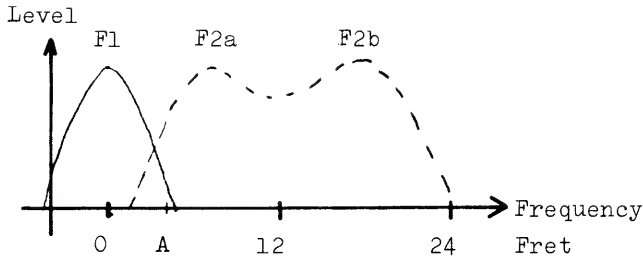
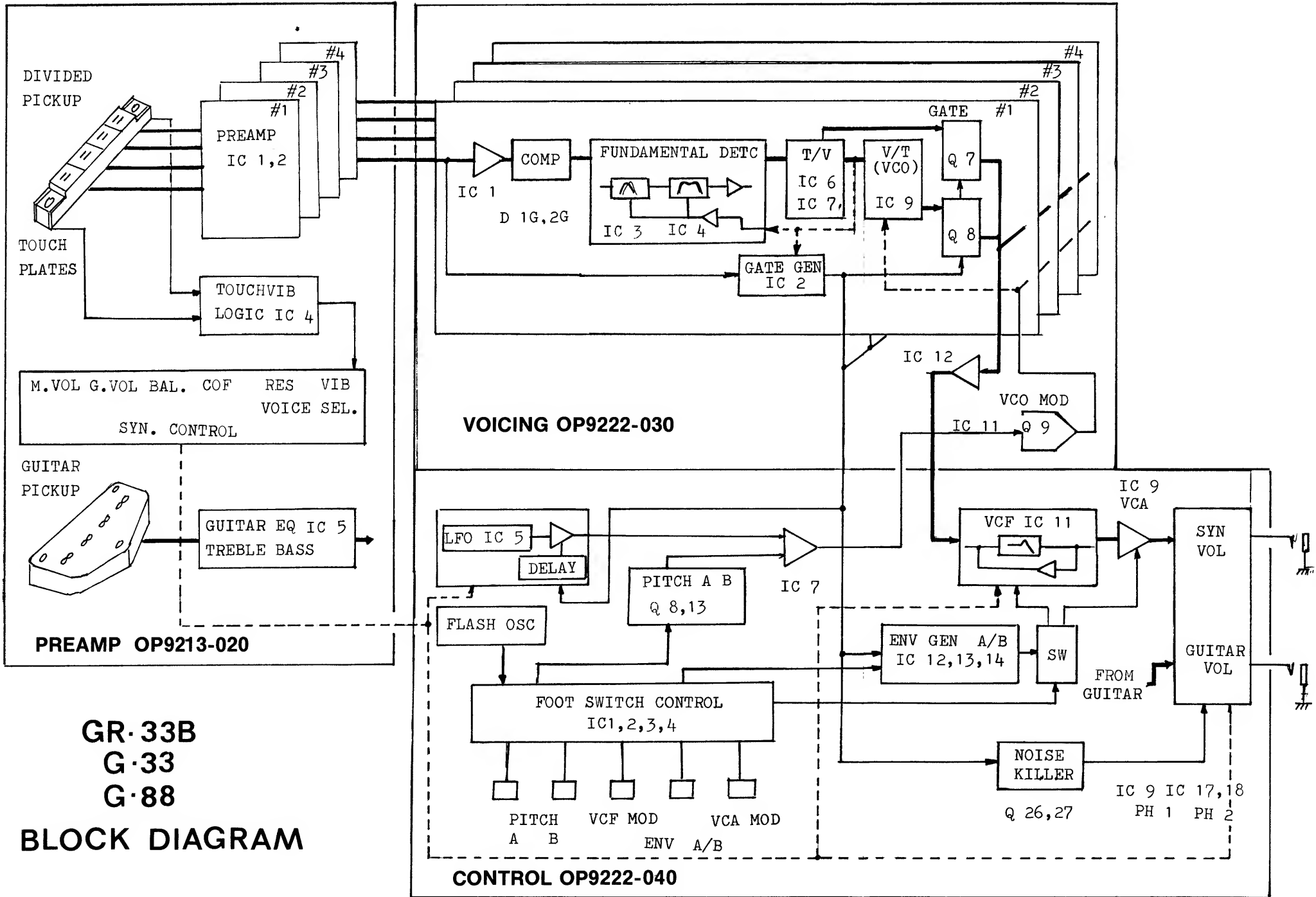


Fig. 1 Filter changes frequency response according to the fret position.



open string. The filter attenuates the 1st overtone or 2nd harmonic content in the passing signal by 24dB.

Picking string with a fretting higher than point A in Fig. 1 causes IC7b to output voltage below that on IC4a pin3 whose output turns to positive. Q3 and Q4, during conducting period, connect R13 and R19 to circuit, making filters' constants different to each other. Resultants are discrete peak frequencies: F2a (frequency around 5-6th frets) from IC3b and F2b (around 18th) from IC4b. Second harmonics of fret-notes in this region are also rolled off by 24dB.

NOTE:
These response curves do not affect sound volume since signal flowing through the filter is used only for pitch determinant. The fundamental is trimmed into squarewave in comparator IC5 and is fed to the next stage, T/V converter IC6, Q5 and IC7.

2. T/V CONVERTER

This circuit is composed of two-stage mono-stable multivibrator IC6(MM1,MM2), constant-current integrator Q5, IC7a, D9, and sample and hold circuit IC8 and IC7b. MM1 and MM2 output plus width positive-going pulses c and d upon receiving edges of respective inputs. There is time lapse with c and d due to the time constant of R38 and CMOS's input capacitance.

The voltage across capacitor C14 increases linearly when charged at a constant rate and decreases to zero when pulse d triggers Q5. The voltage across D9 (pin 7 of IC7a) takes the shape of sawtooth e. Its maximum value is proportional to the time interval between two pulses:

0-10V at open string, and 0-5V at 12th fret. The square wave from MM1 serves as a fundamental in DUET mode.

The waveform is sampled by $\frac{1}{4}$ IC8 each time pulse c is applied and is held by C15 before being reset by pulse d. DC output from IC7b is then applied to IC9b.

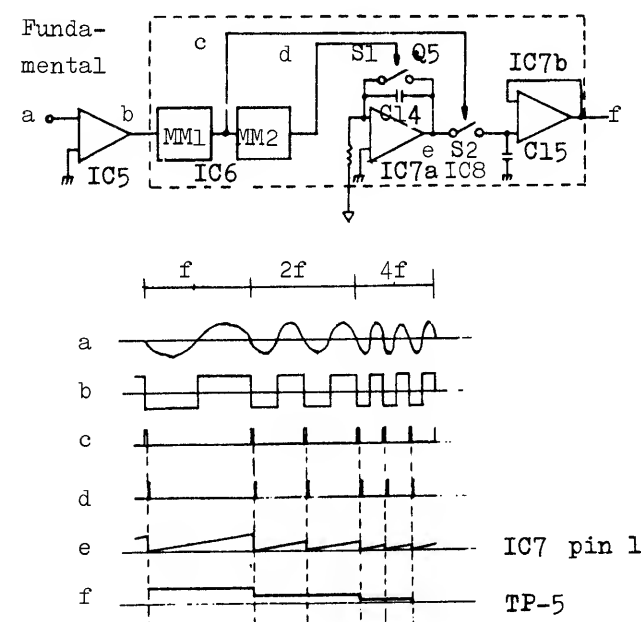


Fig. 2 T/V Converter Timing chart

3. V/T CONVERTER (VCO)

This V/T converter is similar to the T/V Converter in operation. When the charge on C16 increases constantly and reaches the potential equal to that on C18, it causes output from IC9b to conduct Q6 taking the shape of sawtooth waveform whose amplitude is inversely proportional to fret frequency, that is, the lower the fret, the higher the amplitude. This VCO waveform can be modulated or shifted by varying the current flowing into C16. The more the current, the faster charges C16 up to the level on C18. As a result, VCO frequency increases with its amplitude held constant.

4. GATE GENERATOR

The gate generator comprises three circuits - Peak Hold: IC2a, D4 and C9; Reset: IC3a and Q2; Reset Disable: D3, C8 and Q1 - and GATE output IC2b.

4-1. Peak Hold

When picked signal is applied to pin 3 of IC2a, it charges C9 through D4 during ATTACK time. The chargeable potential is proportionate to the signal peak and may be varied from picking to picking. IC2b delivers this voltage as a gate signal at a constant level until Q2 is fired by reset signal.

The signal level at IC2a pin 3 is decreasing after attack time is finished, to the level below that on pin 2 when IC2a turns pin 1 to negative going. D4 being reverse biased, C9 still holds previously charged voltage.

4-2. Reset

Comparator IC3a senses voltage difference between the T/V and S/H outputs, which will be caused by complex harmonics content in string signal at picking and by 2nd harmonic at decay time. Voltage difference between pins 2 and 3 of IC3a turns pin 1 to positive that conducts Q2 via D5, turning IC2b pin 7 (gate out) to 0V.

Reset signals that are inevitably presented to D5 anode should become inoperative during attack time to reproduce very important edge of sound. Below describes how this is done.

4-3. Reset Disable

During attack time IC2a charges C8 through D3 and conducts Q1, shifting positive output voltage from IC3a pin 1 to below D5 forward bias voltage. Duration of this state is determined by C8 R24 time constant because D3 anode will go to negative after attack time is over as explained above in 4-1.

CONTROL BOARD OP-9222-040

The followings are main circuits on the board:

1. FOOT SWITCH CONTROL
2. LFO
3. VCO MOD (PITCH SHIFT)
4. VCF
5. ELECTRONIC VOLUME CONTROL

1. FOOT SWITCH CONTROL

Pressing the footswitch (momentary-close type) applies trigger pulse to C(clock) pin of flip-flops IC1-IC3 through buffer IC4. In this configuration D-F/F is connected as type T-F/F. Capacitor 0.01mfd across the switch prevents contact bounce (chattering) which could cause false triggering.

POWER RESET IC2a generates initial reset pulse for other F/Fs when the power is turned on. Outputs from LED FLASH IC4, D3, Q4 and F/F are ORed at the base of LED drivers Q1,2,3,5,6, 7. LED blinks at the rate of oscillator output when F/F is reset.

2. LFO

One half of IC5 forms hysteresis comparator and the rest half acts as a miller integrator, generating triangular output waveform. The waveform is directed to VCO MOD on VOICING brd via IC6 whose gain is current controlled by VIB DEPTH from Guitar Controller.

3. VCO MOD (PITCH SHIFT)

When PITCH A (B) is pressed, it causes Q8(Q13) connecting to pot PITCH A(B) to be turned on, voltage set by the pot is fed via IC7a to Q9 (anti-log) at VCO MOD on VOICING board.

4. VCF

One chip VCF (IC11 1R3109) comprising anti-log circuit makes up 24 or 12 dB/oct LPF along with its external Rs and Cs. The output is positively fed back to its input for resonant effect through Q17 and VCA IC10 whose gain or amount of resonance is controlled by RESONANCE on guitar controller.

When emphasis is high at a frequency, response curve lower than the peak frequency decreases in level, resulting in relatively small VCF output in this region. This detrimental effect is compensated for by parallely feeding audio signals via VCA which controls amount of feedback and signals at the same rate.

Besides various control voltages, pitch control voltage is fed to VCF control pin via IC7a and IC8a to shift VCF cutoff point in accordance with pitch shift at VCO to maintain suitable filter band width.

Each GATE GEN output from VOICING board is summed at IC7b whose output level determines ENV GEN output level. The shape of ENV GEN output is determined by either A or B ATTACK and DECAY settings being selected by ENV A/B footswitch.

5. ELECTRONIC VOLUME CONTROL

Before being output from OUTPUT jacks, the audio signals are controlled their volumes by photoelectric cells PH1 and PH2 which in turn are remote-controlled at guitar controller.

Output from NOISE KILLER Q26 is also applied to PH1 through Q27. When ENV GEN outputs zero volts, IC17b is disabled, shutting in residual noises in the synthesizer channel.

G-33, G-88

G-33 and G-88 can be used as the ordinary electric bass guitar as well as a guitar controller dedicated to GR-33B. To make them operate as the bass guitar without connection to GR-33B, the circuits that process sound from single-coil pickup can operate from batteries built in.

1. BUFFER

To compensate for sensitivity variations among heads on quadruple pickup, outputs from IC1 and IC2 can be balanced in amplitude by adjusting individual trimmers (VR1-VR4).

2. TOUCH VIBRATO

When a player touches the one of Touch Plates, his body is connecting ground to pin 1 (6) of flip-flop(IC4- c, d), causing; (1)the pin voltage to down below threshold, (2) F/F to reverse its output to L, (3) OR gate(IC4a) to output H, which is inverted through IC3, potential divided by VR10 and fed to connector G3. Since pin 1 of IC4a is led to the touch plate named P.TOUCH, pin 3 goes to L as soon as hand leaves off the plate.

G-33/G-88. ADJUSTMENTS

If tailpiece, bridge, truss rod and/or pickup(s) have been replaced on a given Guitar Controller, or if it seems to be aged or in such conditions under which appropriate play cannot be performed, proceed to adjustments in the order numbered:

- 1 PRELIMINARY; 2 TRUSS ROD; 3 STRING HEIGHT;
- 4 STRING LENGTH

PRELIMINARY ADJUSTMENT

Tighten the strings to eliminate slack.

Check Divided and Bass pickups for clearance from strings..

Lower the pickup, if the top face touches any strings, enough to allow of picking.

Tune the Guitar to playing pitch in Bass set-up.

TRUSS ROD

- Checking Fingerboard and Neck for Cambered, Pulled, Twisted - see Fig. 1

Hold the neck joint with one hand(1); with the other hand, gently hold the guitar head(2). Position the guitar on the table.

View the curve of the fingerboard and neck across the top of the head from both edges alternately(3). With Bass guitar, neck of slight concave bend is considered ideal. Fig. 1,A.

B to H in Fig. 1 are as examples would occur. Of course any combinations of these examples might be found on the guitar.

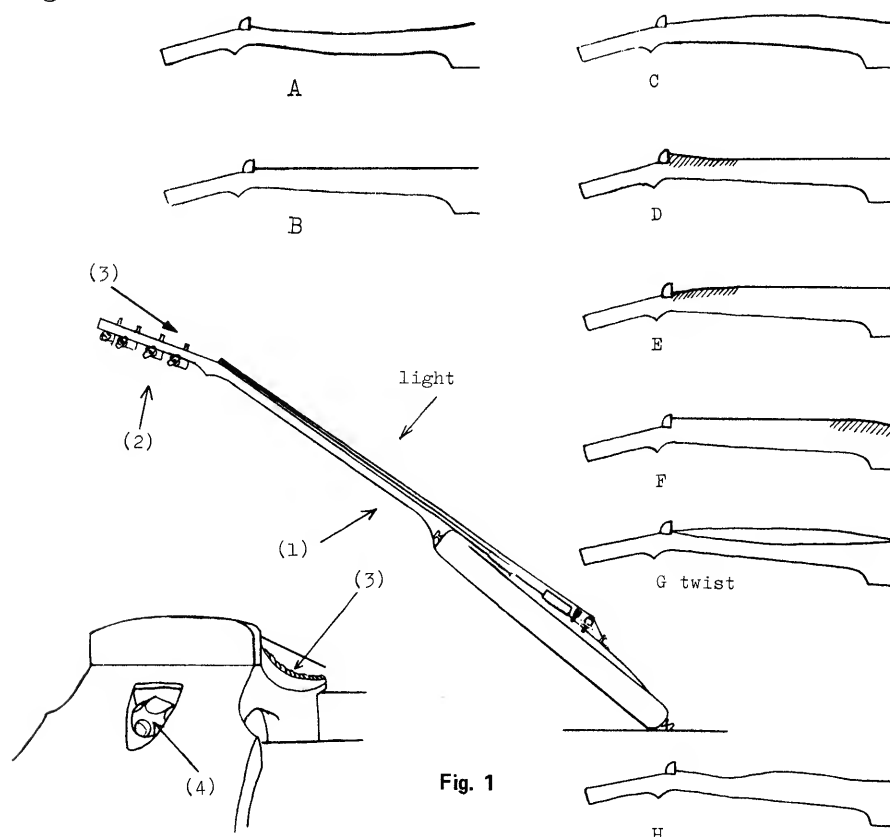


Fig. 1

To adjust truss rod, remove the rod cover. Tighten or loosen the nut(4) with an 8mm nut driver, small degree at a time while checking the result. DO NOT OVER TIGHTEN.

B, C, D -- Adjust truss rod. Check that there is no buzzing when the strings are played open. (Slight curvature dashed in D can be ignored.)

E, F, G, H -- When possible action cannot be obtained after compensation by truss rod adjustment, any adjustments it needs should be left to someone with experience on guitar repair.

ACTION (STRING) HEIGHT

- Bridge, Divided Pickup -

Since bridge height has great effect on divided pickup's sensitivity, adjustment for the one should be associated by for the other.

PRECAUTIONS

Eliminate bridge whose stud(s) does not slip into grooves. Fig. 2.

Bridge height and position on the bridge frame should be determined with the strings at tuned tension, which may be loosened slightly for easier bridge movement.

BRIDGE HEIGHT

Action height adjustments must be taken with a full set of strings on the guitar, the gauge and type will be used, tuned to playing pitch.

With the strings open, measure the distance between 12th fret and the bottom of 1st and 4th strings.

Standard clearances: 1st -- 2.0mm, 4th -- 3.0mm Fig. 3

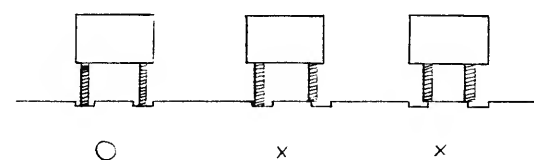


Fig. 2

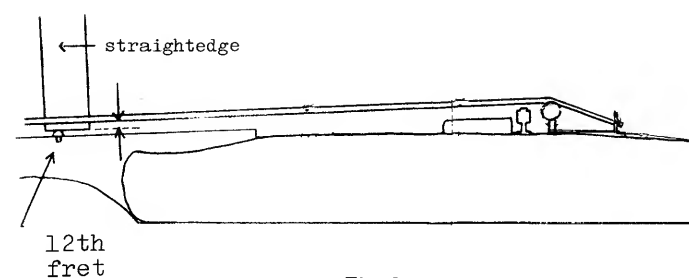


Fig. 3

To adjust bridge height, turn two adjustment nuts using hexagonal nut driver as shown in Fig. 4. Keep bridge top plane as parallel with bridge frame face as possible. Fig. 5

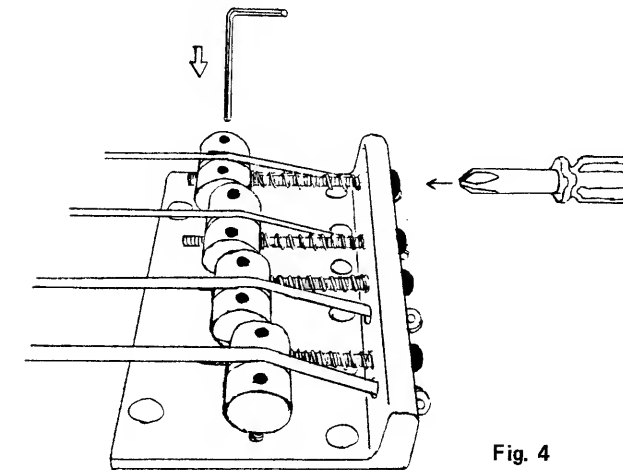


Fig. 4

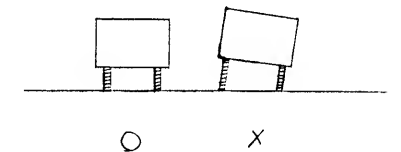


Fig. 5

DIVIDED PICKUP HEIGHT

- Coarse -

Raise divided pickup by turning height adjustment screws alternately until #1 and #4 heads contact with string. If #2 or #3 touches first, raise corresponding bridge. (Re)-adjust #2 and #3 bridges' height for the same string contact as #1 and #4.

- Fine -

After all strings rest on heads, readjust pickup height for the following clearances with respective string fretted at 21st.

Between #1 head top and string bottom --- 1.5mm

Between #4 head top and string bottom --- 2.0mm

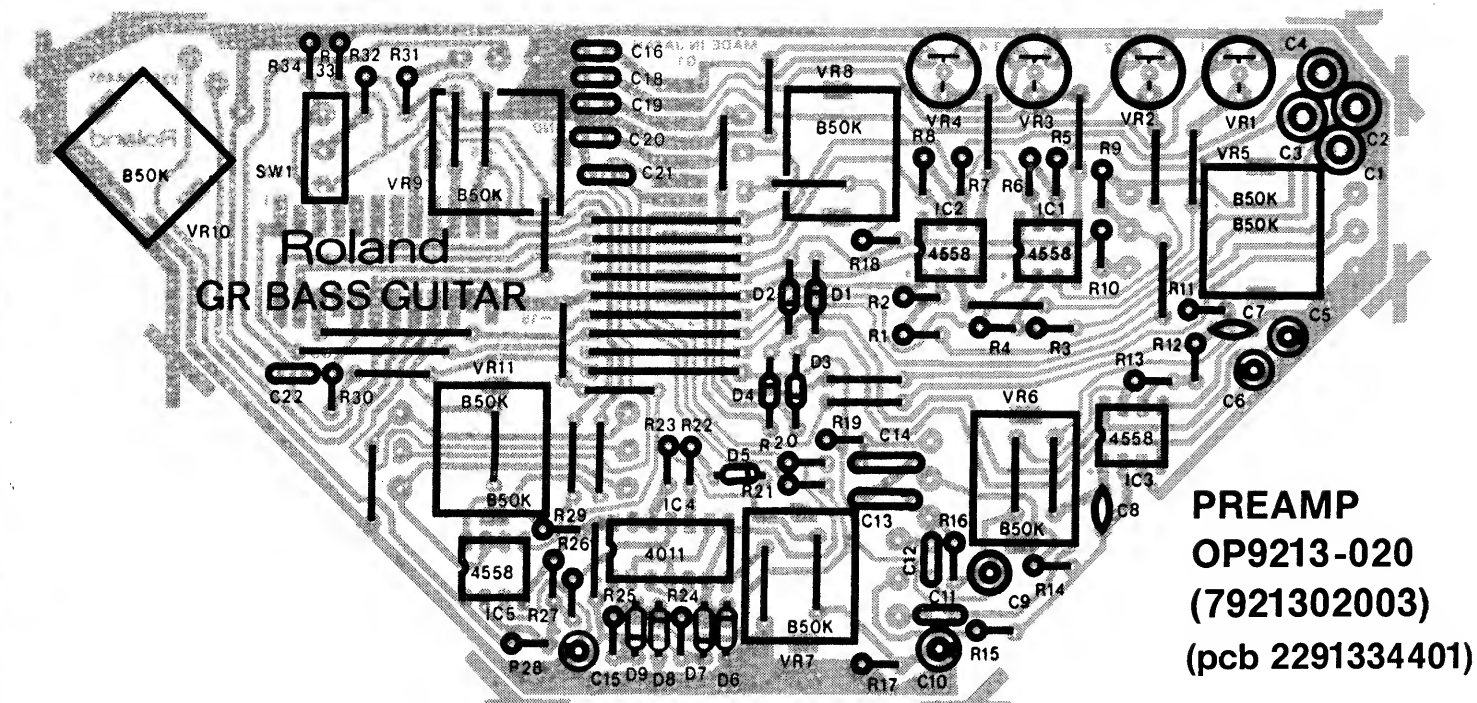
STRING LENGTH (OCTAVE ADJUSTMENT)

Test intonation at the 12th fret whether string is sharp or flat in terms of overall intonation.

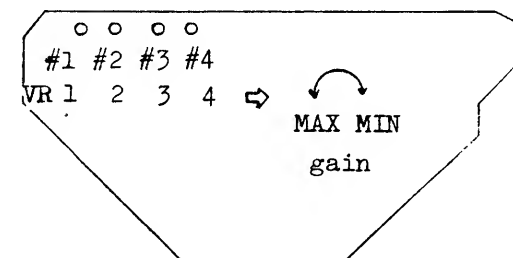
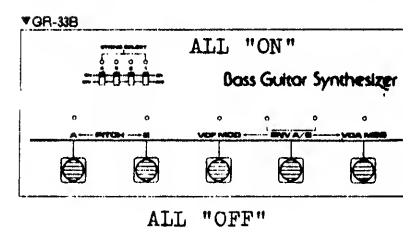
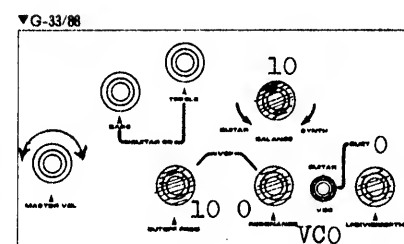
If a string is going sharp at the 12th fret, move back the bridge to add string length by turning the intonation adjustment screw at the bridge frame (Fig. 4). If flat, forwards.

BASS GUITAR PICKUP (Single-Coil) HEIGHT

Possible action on guitar pickup (polepiece/string bottom) depends greatly on strings and players, with strings supplied 4-5mm works well. However, pickup's top surface must be held parallel to the strings.



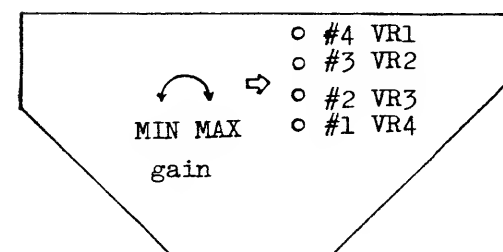
Serial Number 040500 and subsequent



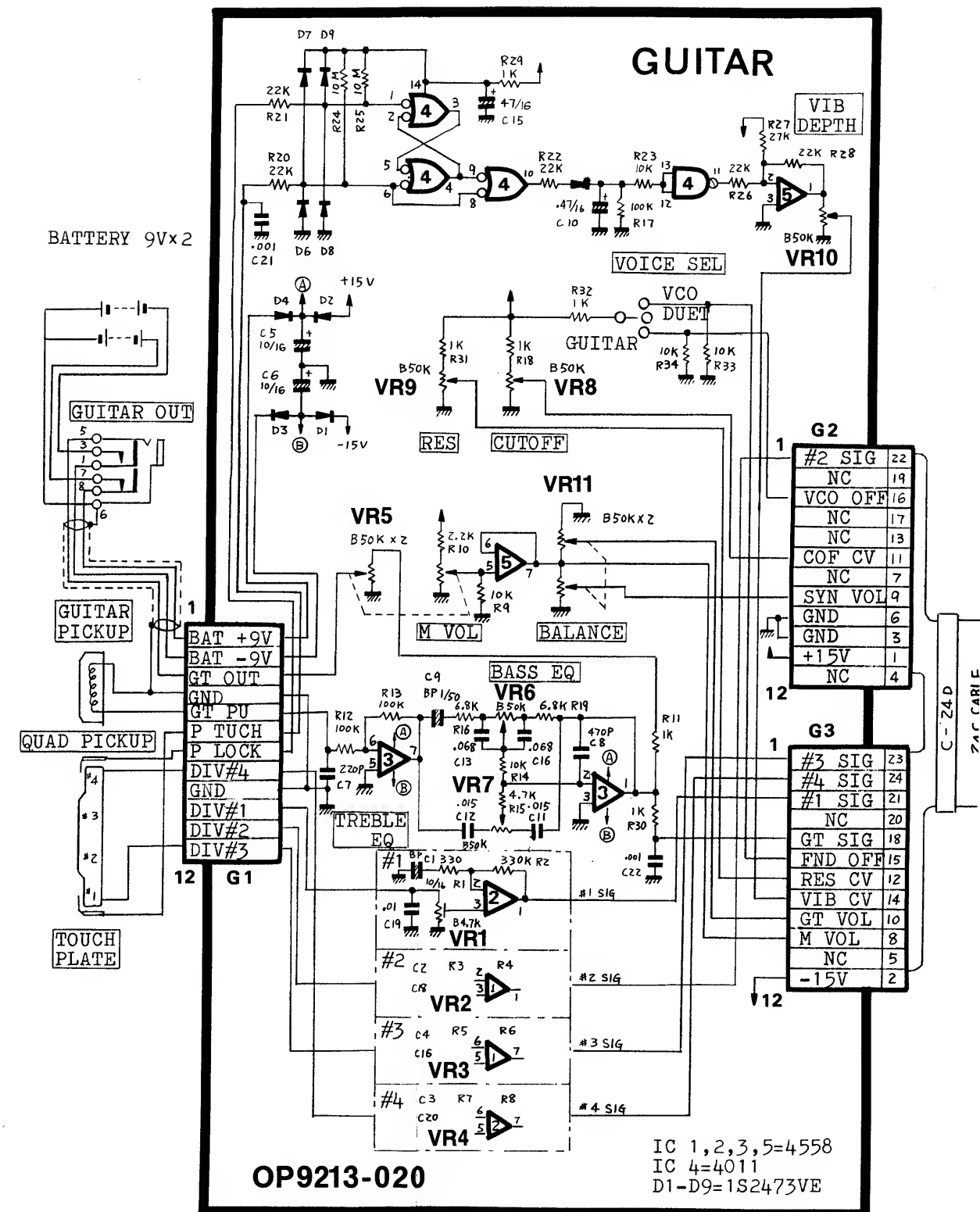
Effective serial number to the modifications is not strict. Both types would be present on products bearing the same lot number, mostly 030400-040599.

NOTE:

As can be seen in the figure below, clockwise rotation in trimmer on early pcb increases buffer gain. On later pcb the reverse will be true.



Serial Number up to 030499



ADJUSTING VCF

DO NOT ATTEMPT THIS ADJUSTMENT PRIOR TO COMPLETION OF VCO TUNE

CUTOFF FREQUENCY

1. Turn RES VR13 fully clockwise(FCW), through hole in the pcb from the foil side. VCF will resonate when a string is plucked.

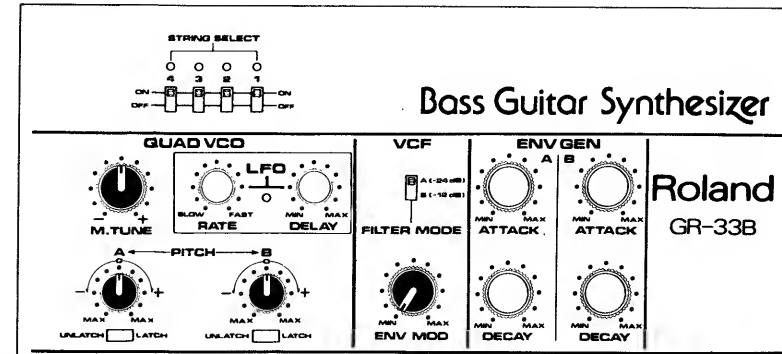
Set controls as illustrated at the right (footswitches: all off). Connect oscilloscope to MIX/SYNTH jack.

CONTROL

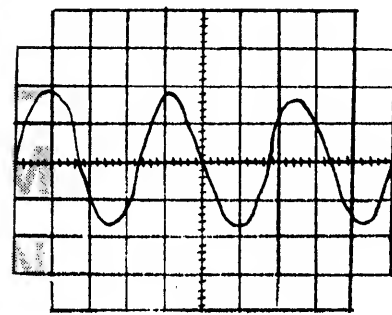
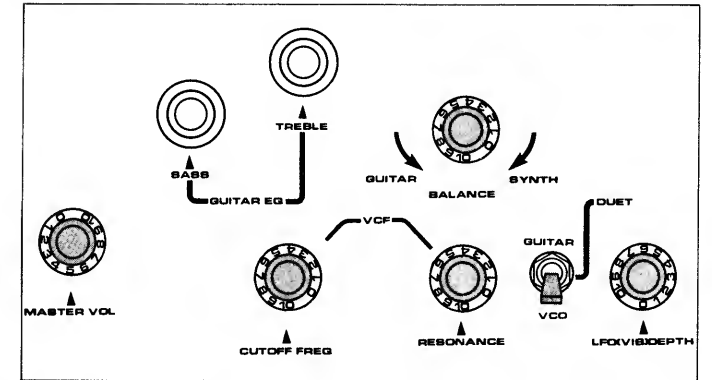
OP9222-040 (7922204001)

(pcb 2291334303)

▼GR-33B



▼G-33/88

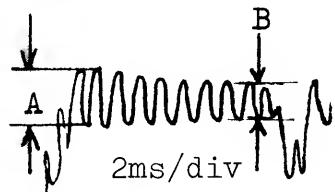


50µs/div

Fig. 1

RESONANCE

1. With VR13 at FCW, re-set CUTOFF FREQ on G-33/G-88 to 5.
2. Pluck 2nd string at open. Adjust VR13 for A:B = 2:1. Fig. 2.

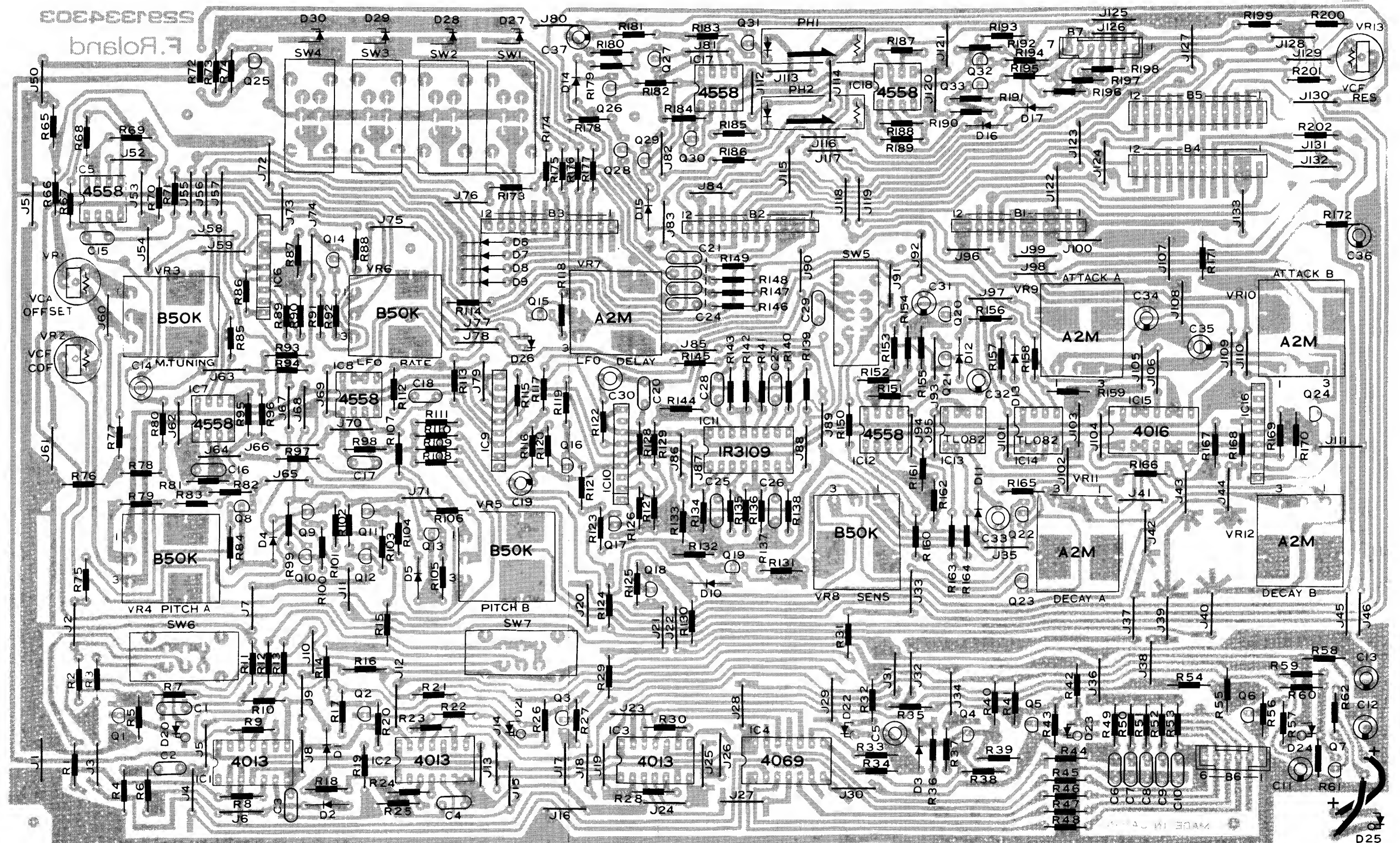


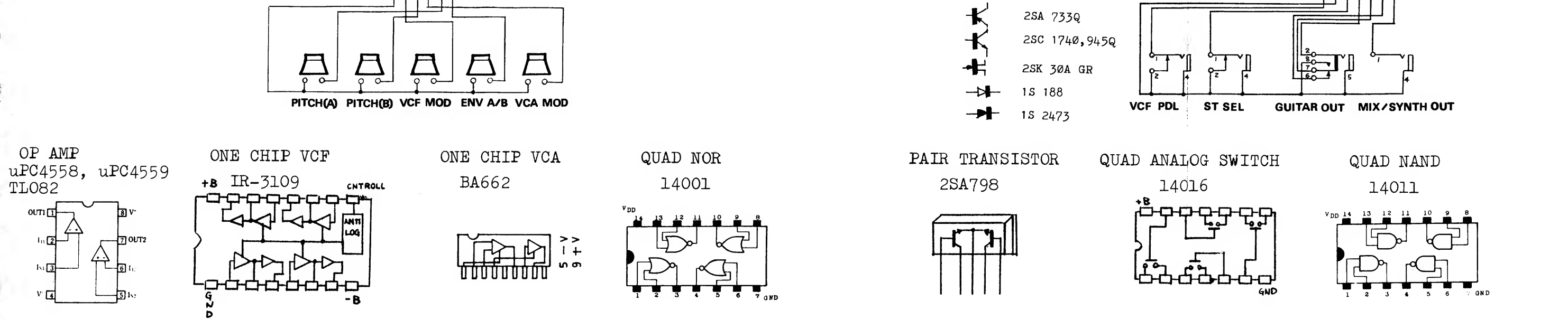
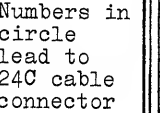
2ms/div

Fig. 2

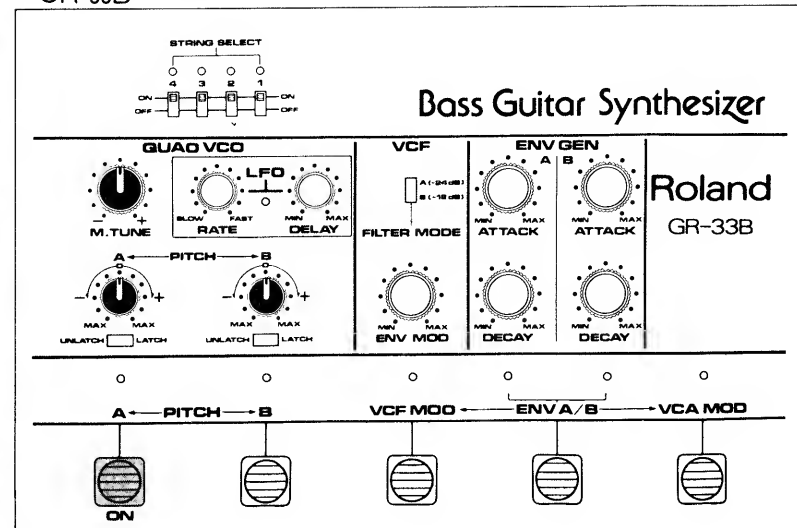
VCA OFFSET BALANCE

Set BAL VR1 for 0V at IC8 pin 7 with no input signal applied.



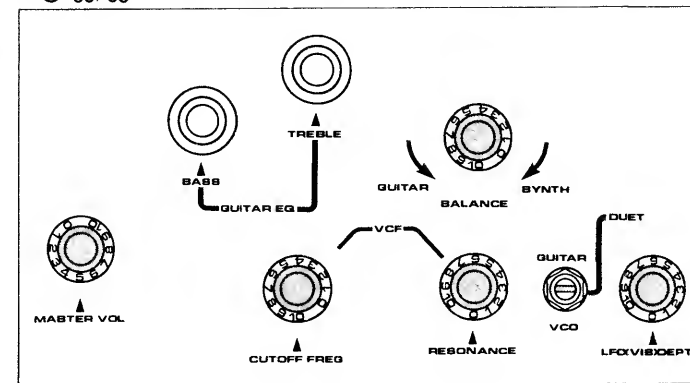


▼GR-33B



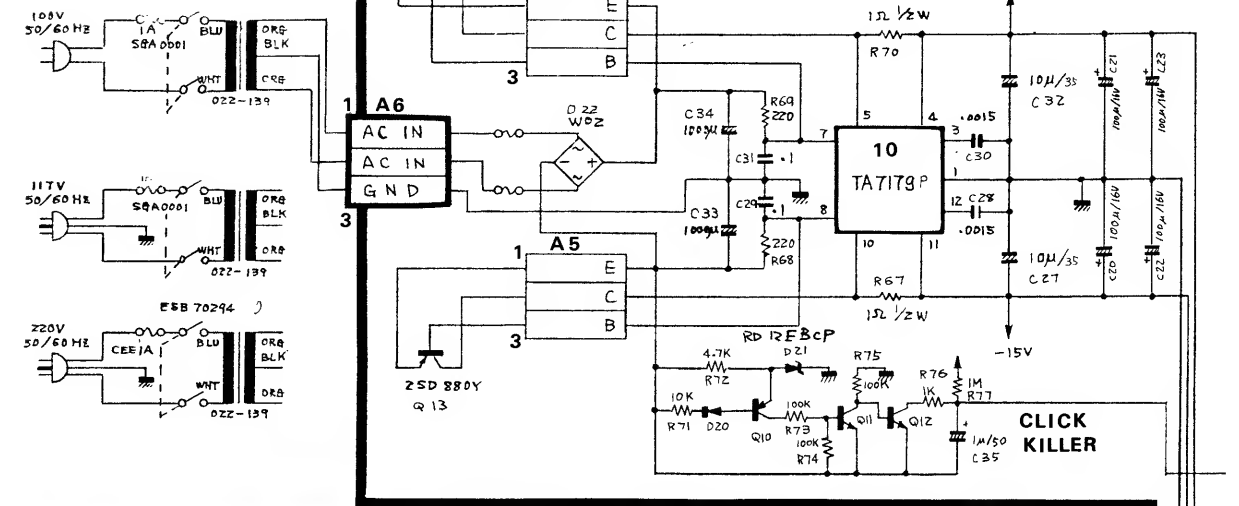
VCO TUNING

▼G-33/88



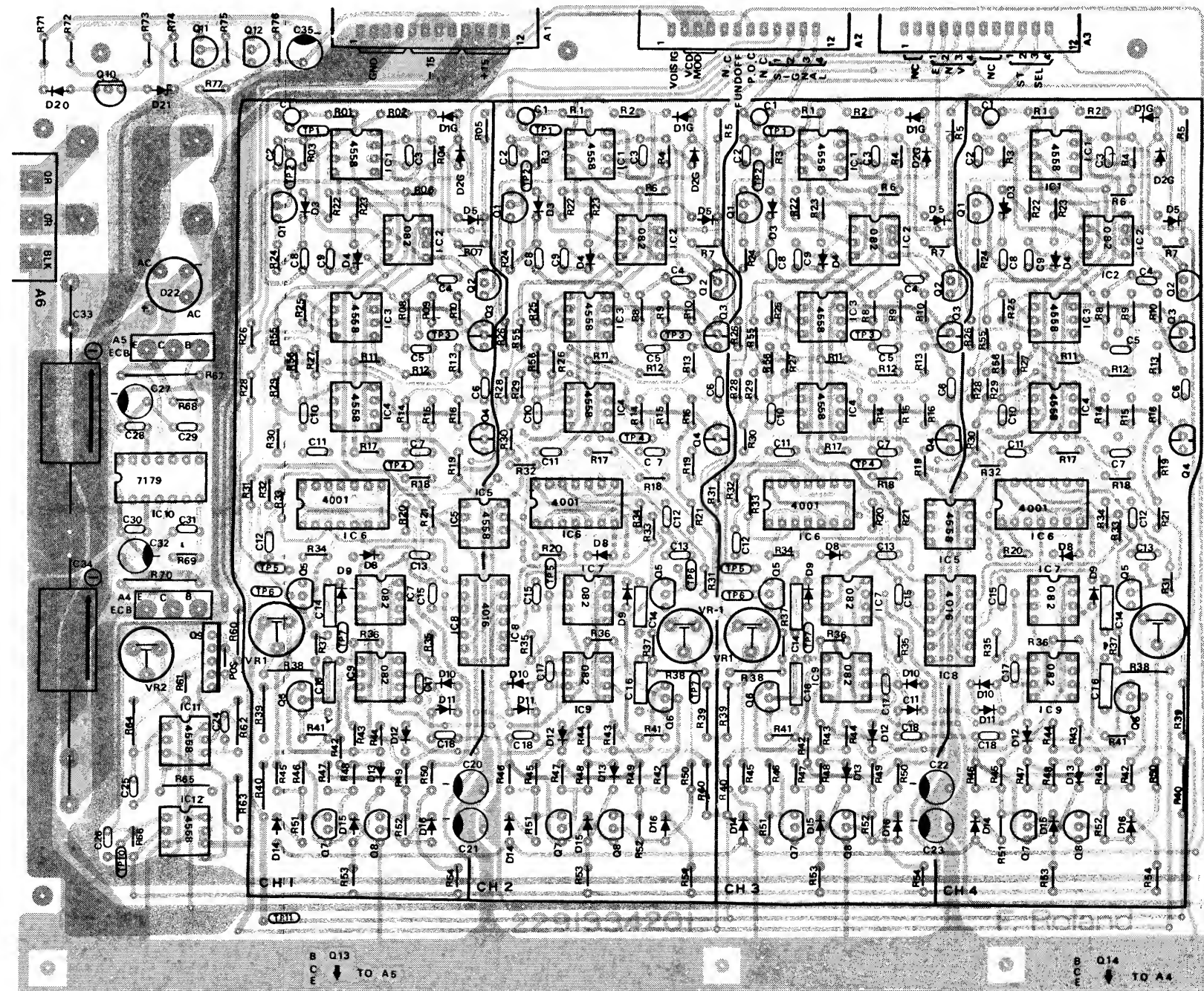
VOICING BOARD
OP9222-030 (7922203002)
(PCB 2291334201)

SECONDARY RATING
 20VAC x 2 @ 300mA

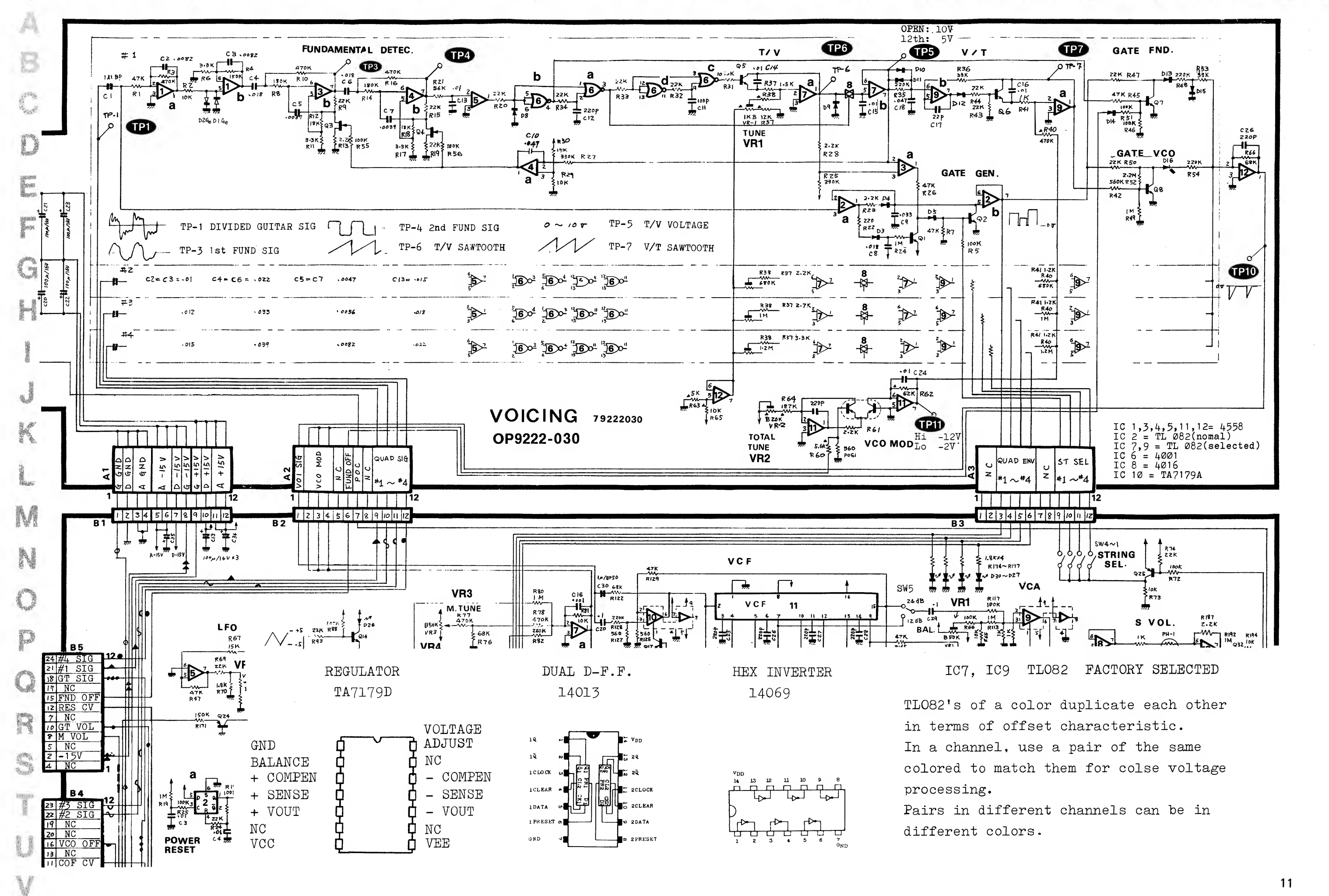


Set controls on guitar controller and GR-33B as illustrated above.

1. Set each TUN VR1(#1-#4) at its midpoint.
2. Play on 1st string at 12th fret. Beat notes will be heard. Tune VCO by turning TOTAL TUNE(trimmer) VR2 until zero beat is heard. Do not turn VR1.
3. Pluck 2nd string with 12th fretting. Set VR1 on channel #2 for zero beat.
4. In the same manner tune #3 and #4 VCOs.
5. Check all strings for detune at open string and 21st fret notes.
6. Fine tune every VCO with VR1 over a string scale.



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40



GR-33B PARTS LIST

SEMICONDUCTOR

PANEL. CHASSIS			Transistor		
2221323000	Panel (front) N-230)		15119106	2SA733-	P or Q
2231020400	Handle (R, L same) N-204		15119108	2SA798-G	dual common emitter
2213370101	Washer N-701 , hadle		15119806	2SB596-	Y or O
2281322800	Chassis N-228 (panel, bottom, w/rubber feet)		15129113	2SC1740-R	
2281322900	Chassis N-229 power		15129815	2SD880-	Y or O
2281021401	Chassis N-214 rear, jack		15139103	2SK30A-GR	
KNOB. BUTTON			Diode		
2247011200	Knob N-112 large		15019122	1S188FM	germanum
2247011300	Knob N-113		15019103	1S2473	
2247051000	Button N-510 power sw.		15019108	1S2473FV	vertical mount leads
SWITCH			15019236	W-02	rectifier stack
2312390300	Switch N-903 foot w/matt		15019548	RD-12EBCP	zener
13159106	Slide SSB02204		15229909	ERS-B33G561	posistor, 560 ohms
13129110	Power ESB-70294		15029109	TLR-105	LED foot switch
			15029102	GL3AR2	LED
			15229702	P-873A (red)	photocuplar
JACK			IC		
13449107	SG-7630		15189105	uPC4558	
13449108	SG-7630G green		15189118	TL082	
13449202	SG-7640R red		151891180A	TL082	factory selected
POWER TRANSFORMER			15199110T0	TA7179P	
22450185N0	PT-N-185 100V		15229802	BA662A	
22450186C0	PT-N-186 117V		15229801	1R3109	
22450187D0	PT-N-187 220/240V		15159101Z0	MC14001BP	
			15159105Z0	MC14013BP	
			15159106Z0	MC14016BP	
			15159116Z0	MC14069BP	
PCB ASSEMBLY			POTENTIOMETER		
7922203002	OP9222-030 VOICING		13219104	FVHRRRA360B54	50KB
2291334201	Voicing less parts		13219102	FVHRRRA360A26	2MA
7922204001	OP9222-040 CONTROL		13299116	SR19RB47K	47KB carbon trimmer
2291334303	Control less parts		13299540	CR19RB1k	1KB metal
2291016600	Flexible wiring N-166		13299544	CR19RB22K	22KB trimmer
2291016700	Flexible wiring N-167		RESISTOR		
			Metal film 1/4W 1% CRB25FX		
			13769227D0	5K	13769167D0 5.6K
			13769173D0	10K	13769175D0 12K
			13769192D0	62K	13769244D0 187K
			13769215D0	560K	13769217D0 680K
			13769221D0	1M	13769249D0 1.2M

CONNECTOR			SWITCH		
13429405	SLC-1204-2324F w/lock shell		13169604	FTE-43B	power
12139302	SLC-1204-24L1 lock shell		KNOB		
13429135	5222-6A 6p		2247018800	KN-02G	large
13429143	5222-7A 7p		224701900	KN-02S	small black
	3022-12A 12p		GUITAR		
2341320700	Connector/wiring assy N-207		2238360200	Divided pickup	
2341020800	Connector/wiring assy N-208		2219327300	Pickup holder (D.pickup)	
13439604	SLC-1204-1324M (C-24D)		2238360500	Pickup PU-144 Bass	
13429404	SLC-1204-1324F (C-24D)		2235330800	Pickup base (bass)	
2291016700	Flexible PCB N-167 12p long		*2213330600	Bridge/tailpiece TP-150 brass	
2291016600	Flexible PCB N-166 made out of N-167		**2213330700	Bridge/tailpiece TP-151 nickel	
13429121	FH1-12S2.54DS 12P flexible PCB socket		*2228331300	Machine head PG-123 gold	
			**2228331400	Machine head PG-121 nickel	
			*2202316900	Adjust rod cover brass	
			**2202362100	Adjust rod cover plastic	
			*2228331100	End pin gold	
			**2228331200	End pin nickel	
G-88. G-33 PARTS LIST			2219327400	Holder N-274 pcb housing frame	
*G-88	**G-33		2202316600	Cover N-166 rear panel	
			2202316700	Cover N-167 battery compartment lid	
			2219510600	Holder N-106 (trimmer)	
PCB ASSEMBLY					
7921302003	OP-9213-020 PREAMP				
2291334401	Preamp less parts				
POTENTIOMETER					
13219106	EVH-RTA304B54				
13219763	EVH-RXA304B54 center detent				
13219766	EWJ-EWA322B54 50KB x 2 dual ganged				
13299113	SR19R 4.7K trimmer				
SEMICONDUCTOR					
15019108	1S2473FV diode V-mount				
15189105	uPC4558				
15159104Z0	MC14011B				
JACK. CONNECTOR					
13439605	SLC-1204-2324M 24 conductors w/locking shell below				
12139302	SLC-1204-24L1 lock shell				
1344939900	Jack SG-7850#01				
13419206	SL-2102 (battery connector)				
13429121	FH1-12S-2.54DS 12p flexible pcb socket				